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A MIXED-METHOD APPROACH TO DEVELOP A FOOD SECURITY FRAMEWORK FOR STUDENTS AT A SOUTH AFRICAN UNIVERSITY

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ABSTRACT

Food insecurity affects the general student population worldwide. The prevalence amongst the student population is higher than what is reported for the general population. Food insecurity predisposes the affected students to a double burden of malnutrition, resulting in a weakened immune system, which may compromise physical well-being and mental health. Amongst the student population, these consequences affect concentration and performance at university. Thus, this study sought to determine the existence and extent of food insecurity amongst undergraduate students at a university in Mpumalanga. The study also aimed to gain insight into the impact of food insecurity through the perspectives and experiences of students. Due to its ability to provide a comprehensive understanding of a phenomenon, the study employed an explanatory sequential mixed-methods research approach, comprising an online survey and focus group discussions. The objective of this study was to determine the food security status of students and propose a framework for addressing their food security needs. Using two food security measures, the 6-item (USDA) food security measure indicates that most students (81%) were food insecure. The Australian 1-item food security measure also reveals that 71% of students were food insecure. Findings of the study also show that institutional factors such as failure to adhere to stakeholder and institutional policies, lack of food security programs, inadequate storage facilities at students' residences, students' background, such as limited financial support, including the absence of supplementary financial support from home are some of the factors that influenced students' access to food. These challenges compromised students' emotional and physical well-being. Food insecurity negatively affects students' university experience, and when combined with malnutrition, it impedes students' persistence and academic success. This contradicts the South African government's objective of empowering impoverished students through a widened access to university. As outlined in the proposed food security framework, proper supplementary initiatives should be implemented to ensure food security amongst university students.

Key words: food insecurity, food security framework, limited funding, a university in Mpumalanga

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INTRODUCTION

Defined as "the lack of consistent physical, social, and economic access to adequate, safe and nutritious food that meets dietary needs and food preferences for an active and healthy life" [1], food insecurity is a universal issue that affects the global population to different intensities [2]. University students are part of the population affected by this global issue. Research studies conducted amongst university students found that students consumed a diet that did not meet their dietary needs [3, 4]. Several factors were identified as reasons for inadequate dietary intake, including a lack of food and insufficient time to prepare food [3]. Challenges related to food insecurity and students' inability to consume a diet that supports their cognitive functioning and overall physical health affect their academic performance and success at university [5].

The large increase in university enrolments at South African universities suggests that students from previously disadvantaged backgrounds are now able to access higher education through funding schemes such as the National Students Financial Aid Scheme (NSFAS) and Funza Lushaka [6]. This expansion of access to higher education has been implemented to address economic inequality and promote economic development [6]. Access to higher education, however, does not guarantee success, especially when students gain access and financing but lack alternative resources to maximise the opportunities presented to them [6].

The university is situated in Mpumalanga, one of South Africa's provinces that experiences high levels of food insecurity. Between 2021 and 2023, research conducted by the Human Science Research Council (HSRC) conducted the National Food and Nutrition Security Survey across the nine provinces of South Africa. The survey reported that 70% of households in Mpumalanga experienced food insecurity, with 17% classified as mildly food insecure, 20% as moderately food insecure, and 22% experiencing severe food insecurity [7]. Research also shows that food insecurity is more prevalent among students who receive financial aid [5,8]. During the course of the study, the majority (87%) of students enrolled at the university were beneficiaries of South Africa's National Student Financial Aid Scheme (NSFAS). This scheme is only available to students from households with an annual household income not exceeding R350 000, and R600 000 for students with disabilities.

Research indicates that reliance on financial aid can impact a student's food security. This means that most of these students may struggle to access food that meets their dietary needs [9]. Furthermore, literature shows that food insecurity is one of the discourses that may affect retention and success at universities [5, 10]. Similarly, the high dropout rates at South African universities have been partly due to food insecurity [8,11]. A study on the impact of food insecurity on dropout rates

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found a 10.5% drop and a 25.7% severe food insecurity among the studied student population. The multivariate logistic regression revealed that students who were moderately food insecure were twice as likely to drop out compared to those who were food secure [11].

Prevalence of food insecurity in universities

Studies conducted in Malaysia, the United Kingdom, Greece, and Nigeria have reported the existence of food insecurity among university students [9, 13, 14]. Similar to the global results on food insecurity among students, 30% of South African students are affected by this phenomenon [8,15]. Food insecurity is a contributing factor to the high attrition rates at South African universities [16]**.** Using a single-item measure, 65% of students registered at the University of Free State (UFS) were food insecure [12], while a multi-measure found that 25% of UFS students were food insecure without hunger and 59% of students were food insecure with hunger; and 51% of students at University of KwaZulu-Natal (UKZN) were reported to be vulnerable to food insecurity [8]. Research studies examining the prevalence of food insecurity have utilised the United States Department of Agriculture (USDA) 6-Item survey module and the Australian 1-item food security measure to determine the existence and level of food insecurity among the studied population. This study adopted the USDA 6-item food survey module and the Australian 1-item module to assess the existence and prevalence of food insecurity amongst students enrolled at the university.

Risk factors

Studies on the prevalence of food insecurity in universities found that students receiving financial aid were at a higher risk of food insecurity [5, 8]. The impact of COVID-19 on the financial well-being of low-income households suggested that students from low-income households were more susceptible to food insecurity. Poor budgeting skills were also found to contribute to students' food insecurity [17]. However, food insecurity is not limited to factors associated with financial constraints. Students' food security status is influenced by various factors, including socio-demographic conditions, nutrition knowledge, parents' education level, and household eating practices [18, 19]. Students from underprivileged backgrounds are more vulnerable to food insecurity compared to students from affluent backgrounds and high cultural capital [20]. This assertion implies that students from poor backgrounds are less likely to succeed in university compared to their affluent counterparts. Halfacre *et al*. [17] and Martinez *et al*. [20] also found that students' ability to secure and prepare their own food may be important in addressing food insecurity in higher education.

Judgements and fear of being regarded as poor are among the factors that contribute to food insecurity in universities [12]. Negative perceptions of food aid and

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the stigma associated with food insecurity may prevent students from seeking help or recommending food security programmes to other students [8]. Van den Berg and Raubenheimer [12] reported that food-insecure students preferred to attend classes hungry rather than risk being labelled poor.

To develop preventive strategies and alleviate food insecurity, it is essential to equip students with the knowledge and skills needed to make informed food choices and maintain a food-secure lifestyle [21]. Food insecure students enrolled at an American university expressed a need to obtain cooking and budgeting knowledge and skills [20]. It is important that university students are equipped with the knowledge, skills and resources that aid self-sufficiency and combat food insecurity [21].

Theoretical framework

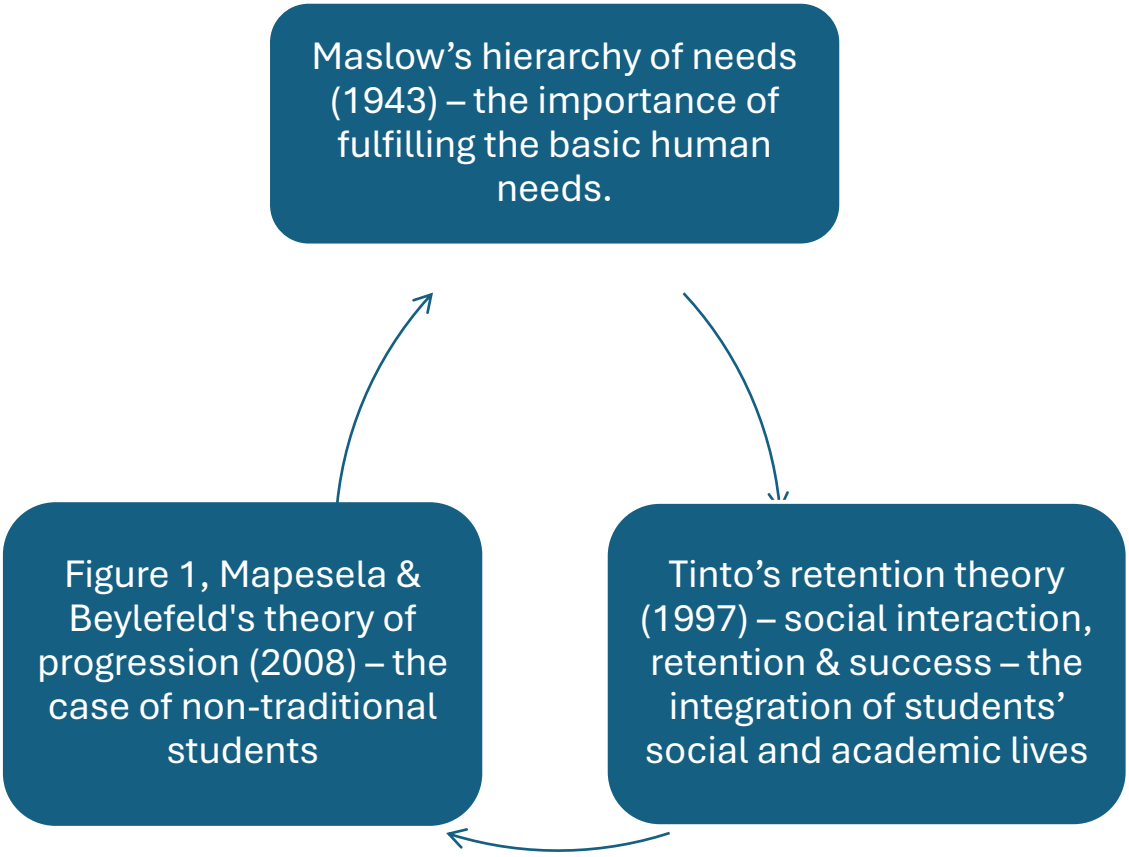

Figure 1: **The theoretical framework**

Three theories underpin the lenses through which this study was conducted: Maslow's hierarchy of needs, Tinto's retention theory, and Jama, Mapesela & Beylefeld's retention theory. These theories are essential for understanding the context and the type of students involved in this study. The theories also demonstrate that food insecurity is both an individual and systemic factor that

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jeopardises students' well-being and retention in university, thereby undermining the aim and purpose of enrolment in higher education. Food insecurity thus extends beyond students' physical and mental well-being into their future aspirations.

Maslow's hierarchy of needs indicates that a human's basic needs, such as food, water, clothing and shelter, supersede other needs. Maslow's theory asserts that failure to satisfy basic needs affects how humans proceed to the other needs depicted in the hierarchy of needs [22, 23]. In his theory, Maslow stated that failure to satisfy the need for food affects health and cognitive functioning [22, 24]. This highlights the importance of fulfilling the basic human needs for the proper functioning of the body. Tinto's retention theory advocates for the integration of students' social and academic lives. The author points out that failure to properly integrate the two would affect how a student adapts, transitions and navigates their academic journey. Tinto's theory links students' retention and persistence in university to their family background, their experience of the university, as well as the university's goals [25]. This theory suggests that a student's cultural capital and economic background, as well as the university's involvement in students' social well-being play an important role in students' persistence and success [26]. Jama *et al*. [27] state that Tinto's theory describes a traditional student and indicate that a South African student from a previously disadvantaged background does not fit the description of a traditional student. The authors describe these South African students as non-traditional students. Jama *et al.* [27] identify key factors that contribute to students' academic retention and success.

The authors suggest that students from wealthier backgrounds are often better prepared to enter higher education. They also state that students' financial stability and independence at university are crucial for their academic success. Furthermore, the authors assert that students with limited financial resources may face challenges such as insufficient funding for accommodation, food, and clothing. If these financial issues are not addressed, affected students can experience demotivation, lower self-esteem, loss of confidence, and poor academic performance [27]. Finally, the authors conclude that difficulties related to students' academic and social lives can lead to poor academic results, failure, or dropping out. The authors emphasise that it is essential for all stakeholders involved in the education of non-traditional students to recognise these realities.

MATERIALS AND METHODS

Study setting

The university is situated in Mpumalanga, one of the provinces experiencing high levels of food insecurity. Research conducted by the Human Science Research Council (HSRC) reported that 70% of households in Mpumalanga experienced food insecurity [7]. The majority (87%) of students enrolled at the university were on

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financial aid. Research shows that students reliant on financial aid are most likely to experience food insecurity [5, 8]. Food insecurity makes it difficult for students to get proper nutrition [9].

Study design

The purpose of this study was to determine the extent of food insecurity at the university and propose a sustainable framework for achieving food security among university students. The study employed an explanatory sequential mixed-methods approach, consisting of two separate phases [28]. Explanatory research addresses the research question through a quantitative approach and explains the results of this phase by employing a qualitative approach to further explore the participants' views [29]. The explanatory sequential mixed-methods approach was employed due to its ability to effectively integrate both the depth of qualitative insights and the breadth of quantitative data. A mixed-method approach provides deeper insights into the whys of phenomena under investigation [29]. Using a quantitative methodology, the first phase identified important trends and linkages, providing a general overview of food insecurity among students. Quantitative data, however, frequently lacks contextual depth. A more thorough investigation of these trends and the discovery of underlying reasons and individualised experiences connected to food insecurity were made possible by the second phase, which was qualitative. This approach ensured a thorough understanding of the scope and causes of the observed patterns. The study yielded a more comprehensive understanding of the issue by fusing quantifiable results with insightful, participant-driven data through the integration of both methodologies.

Data collection

The quantitative phase of the study involved 382 randomly selected research participants, drawn from a population of 3,887 potential participants. A survey questionnaire was administered online to the 382 participants through email. The survey sought to determine the students' food security status, which was achieved by utilising a USDA 6-item food survey module and the Australian 1-item food security measure.

The questions based on the USDA 6-item food survey module asked: *(1) The food that I bought just did not last, and I did not have money to get more." Was that often, sometimes, or never true for you in the last 12 months? - (2) "I could not afford to eat balanced meals." Was that often, sometimes, or never true for you in the last 12 months? - (3). In the last 12 months, since last (name of current month), did you ever cut the size of your meals or skip meals because there was not enough money for food? – (4) [if yes above] How often did this happen—almost every month, some months but not every month, or in only 1 or 2 months? – (5) In the last 12 months, did you ever eat less than you felt you should because there was not enough money*

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for food? – (6) In the last 12 months, were you ever hungry but did not eat because there was not enough money for food? The question that was based on the Australian 1-item food security measure: *In the last 12 months, during the academic term, were there any times that you ran out of food and could not afford to buy any more?*

The quantitative phase was followed by a qualitative approach. This stage involved a purposively selected sample of 36 participants who took part in focus group discussions. Participation in the focus groups was limited to students involved in the first phase of the study. This was intended to enable participants to expand on and provide a deeper insight into the findings of the first phase. The focus group discussions were based on questions related to access and availability of food, healthy eating habits, financial difficulties, experiences with food insecurity, and potential solutions to food insecurity.

Data analysis

Quantitative data was analysed using SPSS 23. This method was suitable for analysing quantitative data and providing numerical analysis of the data and the relationship that may exist between independent variables. Qualitative data was analysed using ATLAS Ti. Data was coded and thematic analysis was done.

Ethical considerations

Ethical clearance was granted by the Tshwane University of Technology, and permission was obtained from a university in Mpumalanga to conduct the study. An informed consent form and information leaflet were provided to the participants. Participation was voluntary, and participants were informed of their rights.

RESULTS AND DISCUSSION

Quantitative phase

Participants' demographic profile

The demographics of the online survey participants show that 65% were aged between 18 and 21, while 35% were over the age of 21. More than half (56.5%) of the participants were female, and 43.5% were male; most (81%) received financial aid. In the focus groups, 56% of participants were female and 44% male; 78% of them were on financial aid.

Using two food security measures, the 1-item Australian food security measure and the USDA food survey module, the study results showed that most students (71% and 91% respectively) were food insecure.

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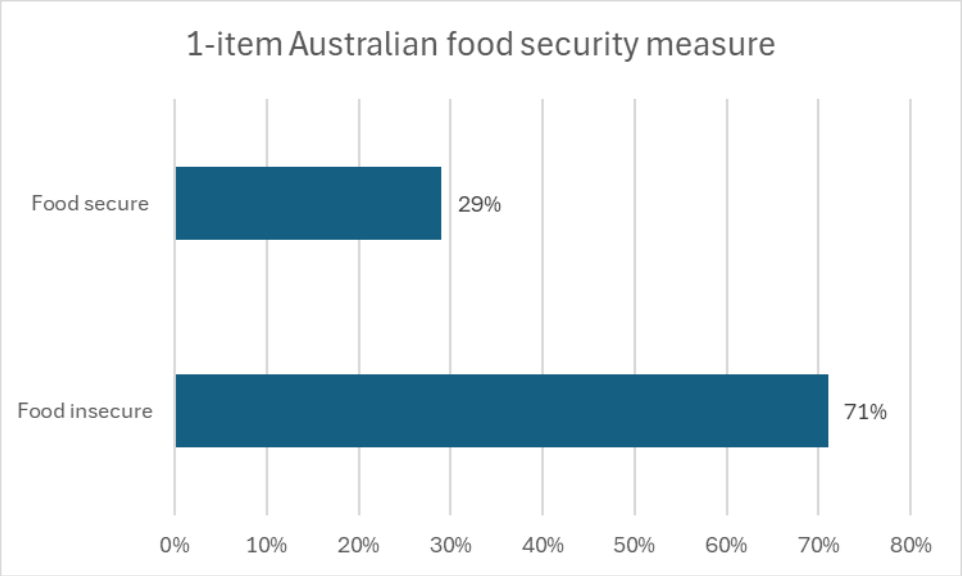

Figure 2: **The 1-item Australian food security measure**

The 1-item food security measure indicated that 71% of the undergraduate student population was food insecure.

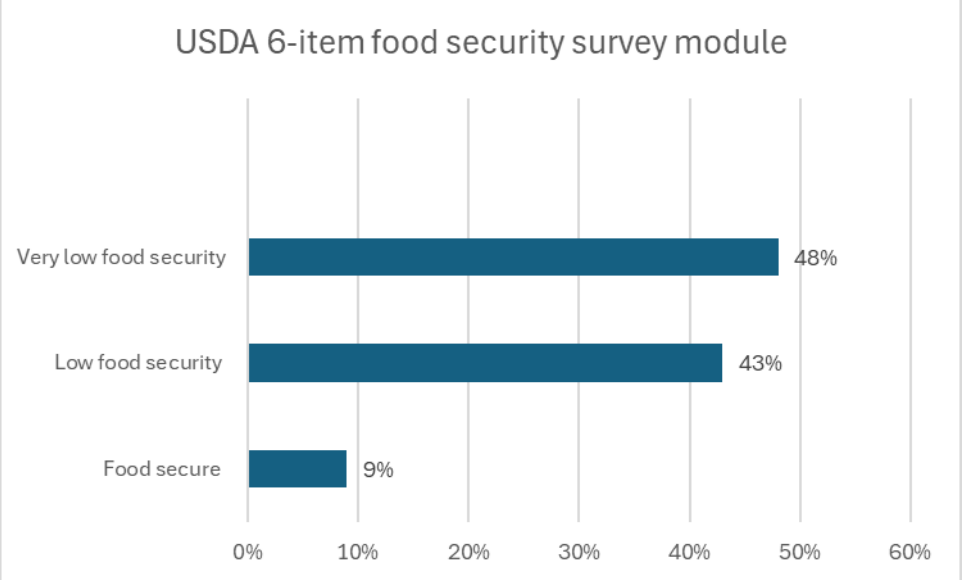

Figure 3: **The USDA 6-item food security survey module**

The 6-item food security measure indicated that 43% and 48% of the participants were experiencing low food security and very low food security, respectively. The results further indicated that most participants (91%) were experiencing some form of food insecurity, with less than 10% classified as food secure.

Qualitative phase

The focus group discussion offered an insight into the students' daily lives and challenges. The results of the qualitative phase of the study show that students faced

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financial difficulties, which stemmed from limited funding, a lack of financial support from their families, poor financial management skills, inadequate nutritional knowledge, unhealthy eating habits, inadequate food preparation skills, and inadequate student accommodation.

Limited funding affects what students can afford and influences their financial priorities. The inability to plan and manage their funds responsibly also strains the limited resources these students have. Studies on food insecurity at universities show that, while some students prioritise food and housing, most focus on other essentials rather than food. Poor nutrition knowledge and limited cooking skills lead to the consumption of unhealthy foods. Students' inability to choose healthier options or prepare nutritious meals compromises their nutritional security [30]. Poor or inadequate nutrition harms health and makes students vulnerable to lifestyle diseases, including non-communicable diseases. These issues can also impair students' cognitive functioning, resulting in poorer academic performance [3, 4].

The discussions also revealed that the cost of food greatly affected access to food. The economy and fluctuation in food prices did not match the available funds. This created financial challenges for the students, as many struggled to manage and survive with the limited resources available to them.

Factors associated with food insecurity amongst the studied student population

Students' socio-economic factors

The results show that students' cultural capital acts as a risk factor for food insecurity. The knowledge and skills a student has influence how well they adapt to new environments. A student's economic background also shapes their financial means and status within the university. Consistent with reports on the impact of financial aid on food security, students relying on financial aid for their basic needs were mostly food insecure [31]. Other factors, such as a lack of financial support from family, limited financial or budgeting skills, and poor financial habits [32], also contributed. Additional factors include inadequate nutrition knowledge, limited cooking skills, poor time management, perceptions of food insecurity, as well as a fear of judgment, all affecting students' food security status [33]. The high cost of food and students' inability to afford it impacted their access to healthy and nutritious food.

Institutional factors

When asked about the food sold at the campus food service centres, students indicated that they were not satisfied with the pricing, taste and portion size of food. Institutional factors such as food services that do not meet students' needs and expectations, lack of university food security initiatives/programs, the Students Representative Council's lack of pro-activeness in dealing with students' food

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security challenges, placement of students in residences that do not have adequate cooking and storage facilities and alternative sources of power during load shedding compromised students' food security status.

Results of this study show that food-insecure students ran out of money to buy food, skipped meals, and purchased and consumed unhealthy food with low nutritional value. These students experienced physical incapacitation and discomfort, stress and anxiety due to hunger which led to skipped classes. This suggests that food insecure students resorted to unhealthy and inappropriate mechanisms to cope with hunger and poverty.

CONCLUSION AND RECOMMENDATIONS FOR DEVELOPMENT

Based on the findings and recommendations of this study, a proposed framework for food security is presented. The framework considered the students' context, the challenges they experienced, proposed solutions, findings, and solutions suggested in previous studies, as well as the solutions deemed viable and proven to be effective in addressing food insecurity in universities.

The framework requires the involvement of financial, educational, and all other stakeholders involved in students' lives, especially within a university setting. Institutions of higher education, such as Stellenbosch University, the University of the Western Cape, the University of the Witwatersrand, and the University of Cape Town, have acknowledged the existence of food insecurity on their campuses through the establishment of food security programmes. Programmes implemented by these institutions have contributed to easing the burden of hunger and poverty amongst students in these universities.

Proposed solutions to food insecurity

The objective of the proposed framework is to improve food security among students by addressing the root causes of food insecurity and promoting healthy, accessible dietary options.

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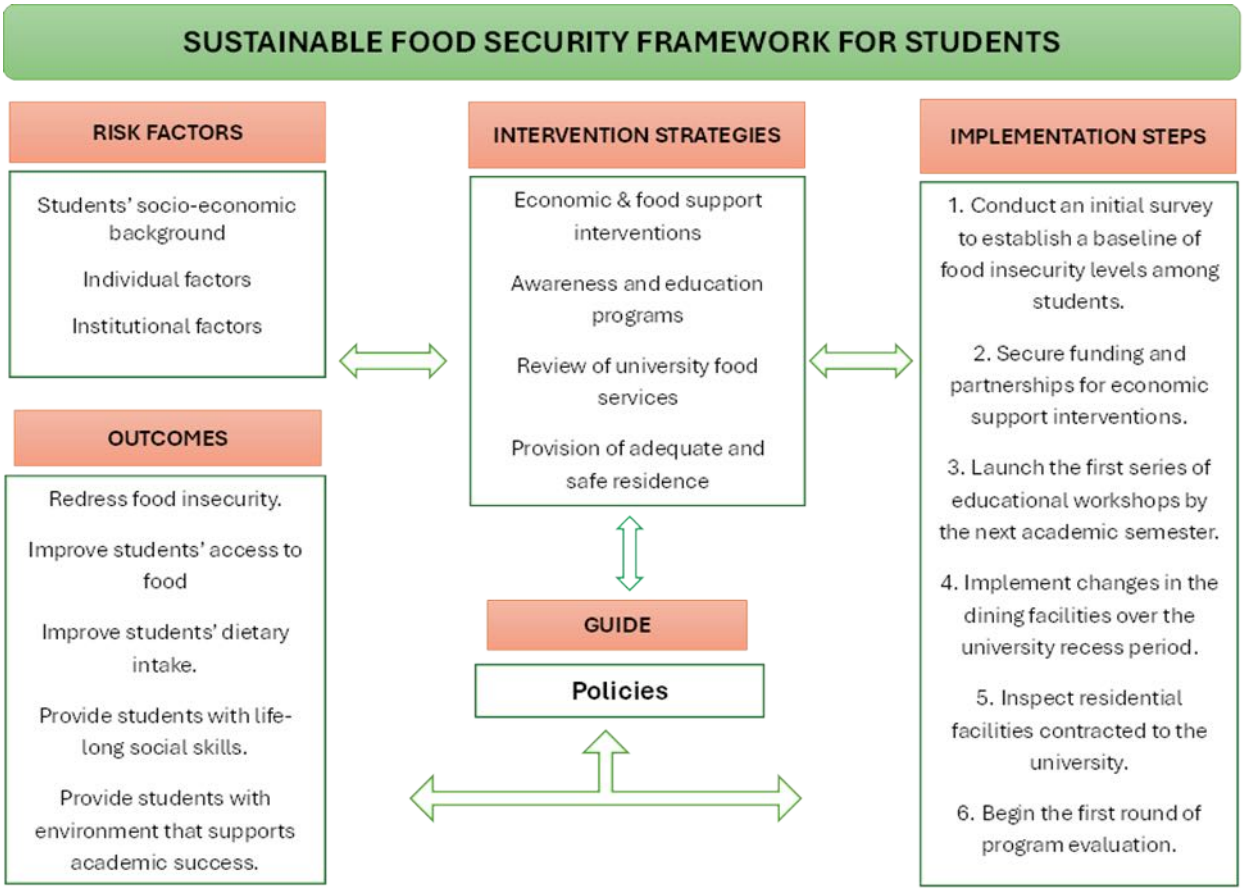

Figure 4: Presents the proposed framework for addressing food insecurity amongst university students

The components of the framework

Economic support interventions

The study's participants reported that their limited financial resources and high food prices were the main reasons they ran out of food. These students stated that to increase access to food, they needed both additional financial assistance and other forms of support. Students suggested food vouchers, soup kitchens, food parcels, and discount coupons as forms of economic assistance interventions that could address the issues of hunger and poverty. These interventions have been implemented at South African institutions of higher learning such as the University of Western Cape, University of Johannesburg, University of Pretoria, University of the Witwatersrand, University of Free State, Stellenbosch University, and the University of KwaZulu-Natal and are proven to enhance students' food security. The proposed economic interventions are important in ensuring access to food. The proposed framework therefore includes the following economic interventions:

- Establish a fund to provide supplementary food vouchers to students identified as food insecure through surveys. The fund can be established with money

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raised through different fundraising initiatives. The money raised can be used to provide students with food vouchers which can be used at the university cafeteria. Food-insecure students can be provided with one or two food vouchers per day depending on the severity of their situation.

- Introduce food banks linked to sponsors. Businesses can be approached, and a request made for the donation of non-perishable and perishable food items which can be used to package food parcels for needy students.
- The Student Representative Council to assist by informing students about the food security assistance programme available on campus. SRC plays a vital role in bridging the gap between university management and students. And thus, in a better position to educate and inform students of the various structures/departments and assistance available on campus.
- Establish a campus food charity drive that will be run through donations received from both staff and students. Funds raised can be used to assist walk-ins and financial aid students awaiting food allowance at the beginning of the academic year after registration.
- Partner with local businesses and food suppliers to secure discounts for students on meal plans and healthy food options. These coupons and vouchers can be used to alleviate the burden of the high food prices experienced by students.

Awareness and education programs

To mitigate the challenges such as poor dietary intake, unhealthy eating habits, limited nutritional knowledge, poor financial and time management and financial behaviour of students, participants proposed awareness campaigns and workshops as possible solutions to the challenges they faced. Students in similar studies proposed similar interventions and these have over time proven to be beneficial to students' well-being and academic performance. The university's catering management policy also states that healthy eating awareness campaigns should be conducted to promote healthy eating. Healthy eating habits are essential for cognitive functioning. The consumption of unhealthy food, poor time management and financial habits affects students' well-being and academic performance. It is therefore important to:

- Conduct workshops and seminars on budgeting, healthy eating, and meal preparation to equip students with the necessary skills to manage limited resources effectively; and Introduction of these basic life skills in the first-year student orientation programme.

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- Introduce online food demonstration videos that students can access from the comfort of their own spaces/time. By making these videos available online, students will be able to access them when needed.
- Implement a campaign to destigmatise food insecurity and encourage students to take advantage of available resources without fear of judgment.

Food services structural changes

In addressing challenges experienced by students in relation to the university food services, the university needs to adhere to the Department of Higher Education and Training (DHET) policy on provision of food on university campuses and the university's catering management policy needs to:

- Review and adjust the pricing structure in university dining facilities to make healthy foods more affordable and accessible. Assess food pricing and how it affects students who are experiencing food insecurity. Evaluate meal pricing and check which meals are considered unaffordable and work out a plan on how to make these meals affordable.
- Involve student representatives in gaining insight on students' experiences and challenges.
- Consult with the university finance department to devise a way of sourcing food suppliers cheaply and cutting down the costs of delivering affordable meals to students.
- Improve the quality, variety, and nutritional value of food offered in university dining halls based on student feedback and preferences. Seek insight and advice from a Nutritionist and dietitian to obtain advice on affordable, nutritious food and also to ensure that price changes do not affect the nutritional value of food.
- Consider implementing subsidised meals to ensure that food-insecure students have access to affordable and nutritious meals.

Adequate and safe residences

Compared to their counterparts housed in university residences, students accommodated in private facilities experienced challenges that further compromised their food security. The university needs to treat all students in its care in the same manner. To address challenges faced by off-campus students and provide for their needs, the university needs to ensure that students are housed in adequately resourced facilities. As outlined in the private accommodation policies of the DHET and the local municipality, the university can accomplish this by:

- Ensuring that all students are placed in residential facilities that provide adequate food preparation and storage facilities, such as lockable cupboards and fridges.

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- Ensuring that all students are placed in residential facilities that have alternative power sources in cases of power outages and load shedding.
- Revising its private accommodation accreditation policy to be aligned with the stipulations of the DHET and the local municipality policies on private accommodation.
- Develop a monitoring system that will ensure that accommodation service providers contracted to the university abide to their contractual obligations, terms and conditions, failing which their contracts should be terminated.

Monitoring and evaluation

Monitoring and evaluation are crucial to ensure that the intervention strategies implemented to address food insecurity achieve their intended objectives. Evaluation is also important for the purpose of improving the measures put in place and this can be achieved by:

- Setting up a system to regularly assess the food security status of students and the effectiveness of implemented measures.
- Soliciting ongoing feedback from students to refine and improve the program.

Implementation steps

Implementation steps are important as they provide guidelines on the process that should be followed to ensure the successful operation of the food security programme.

Evaluation metrics

At the end of the implementation process, the evaluation of the effectiveness of the FSP should commence. The following should be undertaken to evaluate the success and impact of the FSP:

- Survey to determine the reduction in the percentage of food-insecure students.
- A survey to determine students' satisfaction with university cafeteria food.
- Conduct measures to determine the participation rates in educational programs. The number of students who logged in online to watch cooking demonstration videos and the number of students who attended and participated in the awareness workshops.
- A periodic survey to determine students' satisfaction with their residences.

This framework links the quantitative data showing high levels of food insecurity with qualitative insights into the causes and personal impacts of this issue, thus providing a comprehensive approach to tackling food insecurity at the university.

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Conflict of interest

The authors declare that there is no conthe University of Mpumalangaflict of interest.

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Table 1: Explanatory mixed method approach

Study phase	Phase 1	Phase 2
Research approach	Quantitative	Qualitative
Sampling	Stratified random	Purposive
Data collection method	Web survey	Focus group discussions
Data collection instrument	Self-administered questionnaire	Open-ended questions
Data analysis	SPSS	ATLAS.ti 9

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